

What is claimed is:

1. A substrate assembly for a surface discharge type color plasma display panel, comprising:

an insulating plate having a main surface and first and second mutually perpendicular directions defined thereon;

plural address electrodes, each of a straight configuration, supported on the main surface of the insulating plate in spaced, parallel relationship in the first direction so as to define corresponding gaps therebetween, and extending in the second direction;

plural barrier ribs supported on the main surface of the insulating plate, spaced in parallel relationship in the first direction and extending in the second direction, parallel to the plural address electrodes and respectively defining plural elongated cavities therebetween aligned with respective address electrodes, and being continuous throughout the length thereof and of a substantially common length in the second direction ; and

plural color phosphor layers of different primary colors formed respectively in the plural elongated cavities and arranged in a repeating succession, in the first direction, of plural sets of linear strips respectively of said different primary colors, each color phosphor linear stripe extending continuously and without interruption within, and substantially throughout the length of, the respective elongated cavity.

2. A substrate assembly as recited in claim 1, wherein:

each barrier rib has opposite sidewalls substantially transverse to the main surface of the insulating plate, opposed sidewalls of adjacent barrier ribs comprising corresponding sidewalls of the respective, elongated cavity defined therebetween; and

each color phosphor linear stripe is formed so as to extend in the first direction between, and substantially onto and covering, the corresponding, opposed sidewalls of the adjacent barrier ribs.

3. A substrate assembly as recited in claim 1, further comprising a dielectric layer formed on the main surface of the insulating plate, the plural address electrodes and plural barrier ribs being formed on the dielectric layer.

4. A substrate assembly as recited in claim 1, further comprising a dielectric layer formed on the main surface of the insulating plate and covering the plural address electrodes, the barrier ribs being formed on the dielectric layer.

5. A substrate assembly as recited in claim 1, wherein the plural address electrodes are formed directly on the main surface of the insulating plate and the color phosphor layers are formed on the main surface of the insulating plate and covering the address electrodes.

6. A substrate assembly as recited in claim 1, wherein each barrier rib includes, in a direction transverse to the main surface, a lower and an upper portion, the lower portion being of a first, relatively light color for improving brightness of an image display and the upper portion being of a second, relatively dark color for improving contrast of the image display.

7. A substrate assembly as recited in claim 1, wherein the plurality of barrier ribs have top surfaces which are substantially planar and lie substantially in a common plane and have a common width in the first direction not less than 15  $\mu\text{m}$ .

8. A substrate assembly as recited in claim 7, wherein the plural barrier ribs have a substantially common height, within  $\pm 10 \mu\text{m}$  of each other.

9. A substrate assembly as recited in claim 8 wherein the plural barrier ribs have a substantially common height, within  $\pm 5 \mu\text{m}$  of each other.

10. A substrate assembly as recited in claim 1, for use in combination with a second substrate to be disposed on the top surfaces of the plural barrier ribs and having plural pairs of display electrodes extending in the first direction and spaced in parallel relationship in the second direction, the spaced pairs of display electrodes in the second direction defining, with each set of color phosphor linear stripes of said different primary colors, respectively corresponding image elements spaced in the second direction, and each pair of display electrodes defining, with the repeating succession of plural sets of color phosphor linear stripes respectively of said different primary colors, a corresponding succession of plural image elements in the first direction.

11. A substrate assembly as recited in claim 10, wherein each of the image elements is of a substantially square configuration and the respective set of color phosphor linear stripes of different primary colors, of the respectively associated set of elongated cavities, define, in

each image element, respective unit luminescent areas of generally rectangular, common configurations.

12. A substrate assembly as recited in claim 1, for use in combination with a second substrate to be disposed on, and contacting, top surfaces of the plural barrier ribs and having plural pairs of display electrodes extending in the first direction and spaced in parallel relationship in the second direction, the spaced pairs of display electrodes in the second direction defining, with each set of color phosphor linear stripes of said different primary colors, respectively corresponding image elements spaced in the second direction, and each pair of display electrodes defining, with the repeating succession of plural sets of linear stripe patterns respectively of said different primary colors, a corresponding succession of plural image elements in the first direction, the tops of the barrier ribs being spaced from the second substrate by a substantially common distance having a variation between the respective tops of the ribs and the contacting surface of the second substrate of not greater than 20  $\mu\text{m}$ .

13. A substrate assembly as recited in claim 12, wherein the variation is not greater than 10  $\mu\text{m}$ .

14. A plasma display panel comprising:  
a first substrate having a main surface and plural elongated barrier ribs disposed on the main surface in parallel relationship, spaced in a first direction and extending in a second direction along the main surface, different from, the first direction and defining plural, corresponding elongated cavities therebetween of substantially a common length in the second direction, each elongated cavity extending continuously between the corresponding pair of adjacent elongated barrier ribs throughout the length thereof; and  
plural address electrodes, each address electrode of a straight configuration and aligned with a respective pair of adjacent barrier ribs and extending along and throughout the length of the corresponding cavity;  
plural sets of color phosphor stripes, each set comprising a common number of plural color phosphor stripes of respective, different colors received in a respective set of plural, corresponding adjacent cavities, each color phosphorous stripe extending continuously and without interruption substantially throughout the length of the corresponding cavity; and  
a second substrate disposed on the first substrate, contacting the barrier ribs and enclosing the cavities defined therebetween, the second substrate having plural pairs of display

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electrodes thereon, extending in the first direction and crossing the barrier ribs, the corresponding cavities and the associated address electrodes, each pair of display electrodes defining, with the successive sets of color phosphor stripes and respective address electrodes crossed thereby, respective and successive image elements.

15. A plasma display panel as recited in claim 14, wherein the panel selectively produces discharges in the image elements, producing a display viewed through the second substrate.

16. A plasma display panel as recited in claim 14, further comprising a discharge gas sealed within the cavities, the discharge gas comprising a Penning gas mixture of neon with xenon, about 1-15 mole %.

17. A plasma display panel as recited in claim 14, wherein each image element comprises plural unit luminescent areas of respective, plural primary colors, each luminescent unit area comprising a discharge cell.

18. A plasma display panel as recited in claim 17, wherein each cavity corresponds to, and includes, a respective row of plural, spaced discharge cells of the plasma display panel.

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19. A plasma display panel comprising:  
a first substrate having a main surface and plural elongated barriers disposed on the main surface in parallel relationship, spaced in a first direction and extending along the main surface in a second direction, different from the first direction, and defining corresponding plural elongated cavities therebetween, each cavity extending continuously and without interruption throughout the length thereof;

plural address electrodes, each address electrode of a straight configuration and being disposed centrally of a respective cavity and extending along the length of the corresponding cavity;

plural sets of color phosphor stripes, each set comprising a common number of plural color phosphor stripes of respective, different colors received in a respective set of plural, corresponding adjacent cavities, each color phosphorous stripe being continuous and uninterrupted throughout a length thereof and each cavity having only a single, continuous and uninterrupted length color phosphor stripe therein; and

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a second substrate disposed on the first substrate and having plural display electrodes thereon, extending in the second direction and crossing the barrier ribs and the corresponding cavities and respective address electrodes, and thereby defining an array of plural surface discharge cells arranged in rows in the first direction and columns in the second direction, individual discharge cells of each row being separated by corresponding barrier ribs and individual discharge cells of each column being defined by the respective display electrodes crossing the respective cavity

20. A plasma display panel as recited in claim 19, wherein each row of discharge cells, of the array thereof, has associated therewith and is defined by respective first and second display electrodes extending in the first direction and crossing the plural cavities.

21. A plasma display panel as recited in claim 19, further comprising a discharge gas sealed within the cavities, the discharge gas comprising a Penning gas mixture of neon with xenon, about 1-15 mole %.

22. A plasma display panel as recited in claim 19, wherein each image element comprises plural unit luminescent areas of respective, plural primary colors, each luminescent unit area comprising a discharge cell.

23. A plasma display panel as recited in claim 22, wherein each cavity corresponds to, and includes, a respective row of plural, spaced discharge cells of the plasma display panel.

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24. A substrate assembly for a surface discharge color type plasma display panel comprising:

a first substrate having a main surface and plural elongated barrier ribs disposed on the main surface in parallel relationship, spaced in a first direction and extending along the main surface in a second direction, different from the first direction, and defining corresponding plural elongated cavities therebetween, each cavity extending continuously and without interruption throughout a length thereof;

plural address electrodes, each address electrode of a straight configuration and aligned with a respective elongated cavity and extending along the length of the corresponding cavity; and

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~~plural sets of color phosphor stripes, each set comprising a common number of plural color phosphor stripes of respective, different colors received in a respective set of plural, corresponding adjacent cavities, each color phosphorous stripe covering the respective address electrode in the corresponding cavity and being continuous and extending without interruption throughout a length thereof and each cavity having only a single, continuous length color phosphor stripe therein.~~

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25. A substrate assembly as recited in claim 24, wherein the surface discharge color type plasma display panel has plural image elements arranged in parallel rows in the first direction and parallel columns in the second direction, the plural columns of image elements respectively corresponding to the plural sets of color phosphor stripes and the plural image elements of each column, corresponding to respective rows, comprising respective portions, spaced in the second direction, of the respective set of color phosphor stripes.

26. A substrate assembly as recited in claim 25, wherein:  
each set of color phosphor stripes comprises first, second and third adjacent stripes of respective, different primary colors; and  
each image element comprises first, second and third discharge cells corresponding to the respective portions of the respective first, second and third phosphor stripes of the respective set thereof corresponding to the image element.

27. A substrate assembly as recited in claim 25, wherein each cavity corresponds to, and includes, a respective row of plural, spaced discharge cells of the plasma display panel.

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~~28. A substrate assembly for a surface discharge type plasma display panel having plural discharge cells arranged in plural rows and columns, each row comprising plural discharge cells corresponding respectively to the plural columns thereof, comprising:  
an insulating plate having a main surface and first and second mutually perpendicular directions defined thereon;  
plural address electrodes supported on the main surface of the insulating plate, spaced in parallel relationship and so as to define corresponding gaps therebetween in the first direction and extending in the second direction, the plural address electrodes corresponding respectively to the plural rows of discharge cells;~~

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plural barrier ribs supported on the main surface of the insulating plate and disposed respectively in the corresponding gaps between the plural address electrodes and correspondingly spaced in parallel relationship in the first direction and extending in the second direction, parallel to the plural address electrodes and respectively defining plural elongated cavities therebetween, the plural elongated cavities being of a substantially common length in the second direction and each elongated cavity being continuous and uninterrupted throughout the length thereof and accommodating therein a respective column of plural, spaced discharge cells; and

plural color phosphor layers of different primary colors formed respectively in the plural elongated cavities and arranged in a repeating succession, in the first direction, of plural sets of linear stripes respectively of said different primary colors, each color phosphor linear stripe extending continuously and without interruption within, and substantially throughout the length of, the respective elongated cavity, the plural spaced discharge cells accommodated therein corresponding to respective, spaced portions of the continuous phosphor linear stripe.

29. A substrate assembly as recited in claim 28, wherein:

each barrier rib has opposite sidewalls substantially transverse to the main surface of the insulating plate, opposed sidewalls of adjacent barrier ribs comprising corresponding sidewalls of the respective, elongated cavity defined therebetween; and

each color phosphor linear stripe is formed so as to extend in the first direction between, and substantially onto and covering, the corresponding, opposed sidewalls of the adjacent barrier ribs.

30. A substrate assembly as recited in claim 29, further comprising a dielectric layer formed on the main surface of the insulating plate, the plural address electrodes and plural barrier ribs being formed on the dielectric layer.

31. A substrate assembly as recited in claim 29, further comprising a dielectric layer formed on the main surface of the insulating plate and covering the plural address electrodes, the barrier ribs being formed on the dielectric layer.

32. A substrate assembly as recited in claim 29, wherein the plural address electrodes are formed directly on the main surface of the insulating plate and the color phosphor

layers are formed on the main surface of the insulating plate and covering the address electrodes.

33. A substrate assembly as recited in claim 29, wherein each barrier rib includes, in a direction transverse to the main surface, a lower and an upper portion, the lower portion being of a first, relatively light color for improving brightness of an image display and the upper portion being of a second, relatively dark color for improving contrast of the image display.

34. A substrate assembly as recited in claim 29, wherein the plurality of barrier ribs have top surfaces which are substantially planar and lie substantially in a common plane and have a common width in the first direction not less than 15  $\mu\text{m}$ .

35. A substrate assembly as recited in claim 34, wherein the plural barrier ribs have a substantially common height, within  $\pm 10 \mu\text{m}$  of each other.

36. A substrate assembly as recited in claim 35 wherein the plural barrier ribs have a substantially common height, within  $\pm 5 \mu\text{m}$  of each other.

37. A substrate assembly as recited in claim 29, for use in combination with a second substrate to be disposed on the top surfaces of the plural barrier ribs and having plural pairs of display electrodes extending in the first direction and spaced in parallel relationship in the second direction, the spaced pairs of display electrodes in the second direction defining, with each set of color phosphor linear stripes of said different primary colors, respectively corresponding image elements spaced in the second direction, and each pair of display electrodes defining, with the repeating succession of plural sets of color phosphor linear stripes respectively of said different primary colors, a corresponding succession of plural image elements in the first direction.

38. A substrate assembly as recited in claim 37, wherein each of the image elements is of a substantially square configuration and the respective set of color phosphor linear stripes of different primary colors, of the respectively associated set of elongated cavities, define, in each image element, respective unit luminescent areas of generally rectangular, common configurations.



39. A substrate assembly as recited in claim 29, for use in combination with a second substrate to be disposed on, and contacting, top surfaces of the plural barrier ribs and having plural pairs of display electrodes extending in the first direction and spaced in parallel relationship in the second direction, the spaced pairs of display electrodes in the second direction defining, with each set of color phosphor linear stripes of said different primary colors, respectively corresponding image elements spaced in the second direction, and each pair of display electrodes defining, with the repeating succession of plural sets of linear stripe patterns respectively of said different primary colors, a corresponding succession of plural image elements in the first direction, the tops of the barrier ribs being spaced from the second substrate by a substantially common distance having a variation between the respective tops of the ribs and the contacting surface of the second substrate of not greater than 20  $\mu\text{m}$ .

40. A substrate assembly as recited in claim 39, wherein the variation is not greater than 10  $\mu\text{m}$ .

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